

Physics 322: Electronic Devices & Circuits II

M/W 1:00–3:15 PM, SENG 306

Open lab hours Monday 3:15-4:30pm

<https://annaliw.github.io/courses/P322-F26.html>

Physics 322 is an introduction to electronics tailored for students studying Physics. The course focuses on skills that are essential to physics laboratory work, including analog filters, op-amp circuits, analog-to-digital interfaces, control systems, and noise reduction. Emphasis is placed on safe and effective use of lab equipment and on the ability to read schematics and realize them quickly.

The goal of Physics 322 is to train students with practical skills that are useful in experimental physics labs. You will learn how to use digital multimeters and oscilloscopes and cables and power supplies.

Prerequisites	Familiarity with resistance, capacitance, and inductance as taught in Physics 114 or equivalent course. No prior experience with electronics is required.
Instructor	Dr. Anna Wang-Holtzen (awangholtzen@umassd.edu)
Lectures & Labs	The class meets on Mondays/Wednesdays at 1:00–3:15 PM in SENG 306. Attendance is mandatory. Each meeting starts with a 30-45 minute lecture introducing the day's topic. (See next page for a tentative list of topics for the semester.) After the lecture, students work in pairs to build circuits and to explore their behaviors for the remaining time.
Pre-lab Reading	Before each class meeting, a few pages of reading material will be assigned to introduce the basic concepts that will be covered in the class. Each pre-lab reading ends with 1 page of pre-lab hand-ins, a few easy quizzes you must turn in at the beginning of the lecture. Pre-labs are graded on completion.
Post-lab Hand-ins	At the end of each lab, there is 1 page of easy quizzes. They are due at the beginning of the next class. Post-labs are graded for correctness.
Lab reports	Three of our labs will be extended for longer lab reports, where you will practice formal scientific writing. Writing is a process, so there will be revision opportunities for each lab report.
Exams	There will be three midterm exams. There is no final exam. Each exam starts with a written part, which may include reading and/or completing circuit diagrams and observing an electrical signal with an oscilloscope. Students are given 45 minutes to complete the written part and submit the answer individually. After that, the entire class will discuss the circuits together for 15 minutes. The remaining 75 minutes will be a hands-on part, in which students build one of the circuits and demonstrate its function.

Projects There will be an independent project on digital electronics. You will chose your own personal project to pursue using Aduino. The project will be evaluated mainly on your project write-up, which is part of the lab reports category in grading. We will do presentations on the final day, and these will factor into your participation grade.

Grading	Pre/post-lab hand-ins	30%
	Class Participation	10%
	Lab reports	15%
	Midterm Exam 1	15%
	Midterm Exam 2	15%
	Midterm Exam 3	15%

Absences/Extensions Absences from lab can be made up during weekly open lab time. Absences that are not communicated or not made up will affect the class participation grade. **Absences must be made up within one week of the missed class**, unless coordinated in advance with the instructor.

Absences from exams will be handled on a case-by-case basis. If you think you will miss an exam due to illness, university-related travel, or religious observance, contact the instructor as soon as possible.

Pre-lab and post-lab hand-ins are due at the start of each class session. Extensions will be granted for reasonable circumstances such as illness, university-related travel, or religious observance if these are communicated at least twelve hours before the pre-lab is due.

Course Schedule Here is the *tentative* course schedule for Fall 2026.

Week	Date	Topics
1	9/2	1. Resistors and Ohm's Law
2	9/9	2. Input/output impedance
3	9/14	3. Capacitors. Charging/discharging capacitors
	9/16	4. AC circuits: phase and amplitude relationship ¹ .
4	9/21	5. Capacitors and inductors: RC filters, LC circuit (Lab 4 first draft due)
	9/23	6. Resonant circuits.
5	9/28	7. Diode circuits: clamp, rectifier, and AC-to-DC circuit.
	9/30	8. Impedance matching: Cables and transmission lines (Lab 4 final draft due)
6	10/5	Midterm 1: AC and DC circuits
	10/7	9. Introduction to transistors
7	10/13	10. Transistor circuits I
	10/14	11. Transistor circuits II
8	10/19	12. Op-amps I: amplifier, feedback, comparator (Lab 11 first draft due)
	10/21	13. Op-amps II: summing, integrator
9	10/26	14. Op-amps III: active filters
10	11/2	15. Op-amps IV: limitations, stability and compensation, instrumentation amps (Lab 11 final draft due)
	11/4	16. Introduction to digital electronics
11	11/9	Midterm 2: transistors and op-amps
12	11/16	17. Introduction to microcontroller (Arduino)
	11/18	18. Arduino: Input and output
13	11/23	19. Arduino: Input and output
14	11/30	20. Arduino project work
	11/2	21. Arduino project presentations (write-up due)
15	12/7	Midterm 3: digital circuits